Pierre Wulles — Post doc

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French and English

Education

Université Grenoble Alpes — **Grenoble**
PhD in fundamental physics, supervised by Dr. Sergey Skipetrov — *2021–2024*
Topological photonics in two-dimensional atomic lattices

Université Grenoble Alpes — **Grenoble**
Master 2 in Fundamental Physics, with high honors — *2020–2021*
Specialization in subatomic physics and cosmology

Université Grenoble Alpes — **Grenoble**
Master 1 in Fundamental Physics — *2018–2019*
Master's degree in fundamental physics research

Phelma — **Grenoble**
École d'ingénieur — *2017–2018*
Engineering School specialized in Physics

Lycée Faidherbe — **Lille**
Prépa MPSI-MP — *2015–2017*
Preparatory classes for competitive engineering school entrance exams

Experience

LPMMC — **Supervised by Dr. Sergey Skipetrov**
Post-doctorate — *Oct 2024–Present*

- **Scientific software development**: improving the Python package I created: PyBott. This includes unit testing, benchmarking, writing documentation, etc.
- **Finite difference methods**: using `meep` and `mpb` to solve Maxwell's equations in Kekule Model.

LPMMC — **Supervised by Dr. Sergey Skipetrov**
PhD Student — *Oct 2021–Sep 2024*

- Topic: **Light Propagation in Disordered Topological Metamaterials**
- My thesis focused on wave propagation in media undergoing order-to-disorder transitions, with a specific emphasis on studying the **topological** properties of these media. To achieve this, I have conducted **numerical simulations** on clusters to model simple systems such as tight-binding models, as well as more complex systems such as light propagation in resonator networks. This approach places my thesis at the interface between fundamental physics and **computational physics**.
- Two talks I gave to explain my work: on tight-binding models and my PhD defense.
- Skills used:
  - **Python**: I developed documented and reliable Python code for computing band diagrams, calculating topological indices, and simulating light propagation, see for example PyBott, a package to compute the Bott index.
  - **C/C++** I wrote small modules later call within python, see for example.
  - **Rust**: improving existing modules written in python, see for example.
  - **Finite difference methods**: meep, mpb, see for example.
  - Parallel programming: open-mp, intel one-api, HPC.
  - Topology: Chern number, **Bott index**, vector bundles, K-theory.
- The majority of my code is available on GitLab
- Regional finalist of *Ma thèse en 180 secondes* (science popularization contest)

UGA

Teaching Assistant *Jan 2022–Jun 2024*

- **Functional and Algorithmic Programming**: Lectures, Tutorials, Practical work on **OCaml**. Concept. Designing multiple exam topics, numerous interactive quizzes for continuous assessment. See section Teaching. (2022-2024)
- Linear algebra: Oral exams (first year of bachelor's degree). (2022)
- Analysis: course for second-year biotechnology students. (2022)

LPMMC **Supervised by Dr. Sergey Skipetrov**

Internship *Mar–Jun 2021*

- Topic: Light Propagation in Honeycomb Networks of Point-like Scatterers

Lycée Jean-Paul Aubry **Education nationale**

Math/Physics Teacher *Sep 2019–Jun 2020*

- Topics: Mathematics and Physics. *(Teaching in a public highschool)*

IPAG **Supervised by Dr. Pierre Hily-blant**

Internship *Jun–Aug 2019*

- Topic: Study of a Pre-Stellar Core with MCMC methods, see the report
- Skills used: Python, signal analysis, data analysis

CERN **Supervised by Dr. Marc Bengulescu**

Internship *May–Jul 2018*

- Topic: Remote Forwarding of Human-Machine Interfaces for Industrial Controls, see technical report
- Skills used: Linux, Python, C/C++, Qt, Xpra

Skills

Programming: Python, C, OCaml, Bash *(daily use)*
Meep, Rust, C++, lisp, open-mp, mkl, intel one-api, HPC *(occasional use)*

Illustration: Blender, Inkscape, Gimp *(weekly use)*

Operating Systems: Linux (Debian/Archlinux)

Others: Emacs, reveal.js *(tool for slides)*, Git, Latex, TeXmacs, arduino, raspberry pi, HTML, CSS, Hugo

Hobby: repairing old tractors.

Languages: French (native), English (fluent)

Publications

Wulles, Pierre and Sergey E. Skipetrov. **Topological photonic band gaps in honeycomb atomic arrays**. *SciPost Phys. Core*, 7(3):051, August 2024. https://www.scipost.org/SciPostPhysCore.7.3.051.

Sergey E. Skipetrov and **Wulles, Pierre**. Photonic topological Anderson insulator in a two-dimensional atomic lattice. *C. R. Phys.*, 24(S3):39–54, 2023. https://comptes-rendus.academie-sciences.fr/physique/articles/10.5802/crphys.147/.

Skipetrov SE and **Wulles P**. Topological transitions and anderson localization of light in disordered atomic arrays. *Physical Review A*, 105(4):043514, 2022. https://journals.aps.org/pra/abstract/10.1103/PhysRevA.105.043514.

Wulles Pierre. Remote forwarding of human-machine interfaces for industrial controls. Technical report, CERN, 2018. https://cds.cern.ch/record/2633643/files/ShortReport.pdf.